Pesticide Safety Information Series N
Worker Health and Safety Branch

N-3 ENGINEERING CONTROLS (Closed Systems, Enclosed Cabs, Water Soluble Packaging) In Noncrop Settings

General Information:

Engineering controls are methods used to reduce exposure (closed system, enclosed cabs, water soluble packaging, etc.) other than personal protective equipment (respirators, gloves, etc.). Engineering controls are preferred over personal protective equipment (PPE) for reducing exposure. Hand-pouring highly toxic pesticides is a very hazardous activity, and has resulted in many serious human illnesses and injuries. Many more pesticide-related illnesses and injuries resulted from unprotected persons applying toxic pesticides. Proper use of engineering controls reduces the potential for human exposure. On the other hand, improper use, cleaning or maintenance of these systems can also lead to excess exposure. In many instances, substitution of PPE required by label or California regulation is allowed when properly using some engineering controls (see Table 1).

Closed Systems:

The closed system requirement applies primarily to use of pesticides in agricultural settings. However, handlers must use a closed system to mix and load minimal exposure pesticides (MEP), regardless of the intended use. Even if not required, proper use of a closed system can reduce mixer/loader exposure.

A "closed system" is a procedure for removing a pesticide from its original container, rinsing the emptied container, and transferring the pesticide and rinse solution through connecting hoses, pipes and couplings that are sufficiently tight to prevent exposure of any person to the pesticide or rinse solution. No rinsing is required when:

- the pesticide is used without dilution
- the container is a returnable or reusable container that will be sent back to the registrant

If you use a closed system, you must receive training on the proper use and necessary safety precautions during use.

You must wear PPE as required by the label or California regulations. Some substitutions for label-required PPE are allowed when using a closed system (Table 1). All PPE required by the pesticide label must be present at the work site for emergency use. Eye protection and gloves are still required in some instances when using a closed system (see Table 1 for exemptions).

California's Closed System Criteria: To meet California's requirements, a closed system must:

- remove the pesticide from the original container
- rinse the container
- transfer the pesticide to the mix tank
- be made of materials appropriate for use with pesticides and a pressurized system
- have gauges protected against breakage
- adequately measure the pesticide used
- have shut-off valves to prevent chemical from spilling when the hose is disconnected.

Do not remove the probe from the container unless the container is empty and rinsed, the pesticide was used undiluted and the container is empty or the probe has been approved for removal from partially empty containers. The system must have shut-off valves to prevent chemical from spilling when the hose is disconnected or removed. For more details on closed system criteria, contact the California Environmental Protection Agency, Department of Pesticide Regulation (DPR). You may obtain a list of closed systems that have been evaluated and found to meet these criteria from DPR ((916) 445-3920).

The system must be cleaned and maintained according to the manufacturer's instructions. If the system is not a commercially produced system, it must be maintained on a regular basis. A record of cleaning and maintenance must be kept.

Water Soluble Packaging:

Use of pesticides in water soluble packaging (WSP) is considered equivalent to mixing with a closed system. However, dilutions of MEPs in WSP must be transferred (i.e., from a mix tank to the application vehicle tank) via a closed system. DO NOT cut open WSP to use a partial package. This invalidates the closed system equivalency and puts you at risk of over exposure.

Enclosed Cabs:

Proper use of enclosed cabs reduce exposure of some applicators. An enclosed cab is a chemical resistant barrier that completely surrounds the occupant of the cab and prevents contact with pesticides or treated surfaces outside the cab. Enclosed cabs can include a closed cab on a spray rig or a truck or car with the windows and doors closed. There are two types of enclosed cabs:

- Cabs that have only the physical barriers (doors, windows, etc.) to prevent exposure
- Cabs acceptable for respiratory protection. The latter cab incorporates a dust/mist filtering and/or vapor/gas purification system in addition to the physical barrier. These cabs must meet certain criteria and be approved by the director of the DPR.

This leaflet assists readers in understanding pesticide regulations. It is not a legal document. The legal reference can be found in the California Code of Regulations, Title 3. The words "must" and "should" used in the text are not the same. The word "must" means the action is required and comes from California regulations. The word "should" means additional handling practices that are recommended to further reduce exposure.

Table 1: Allowed Substitutions for PPE When Using Engineering Controls

When using the following:	Handlers may substitute:*	For the following:
Closed system for pesticides with "Danger" or "Warning"	Coveralls, chemical resistant gloves and chemical resistant apron	PPE required on the pesticide labeling
Closed system for pesticides with "Caution"	Work clothing	PPE required on the pesticide labeling
Closed system under positive pressure	Protective eyewear**	
Mixing pesticides in water soluble packets	Use in water soluble packets***	Use of a closed mixing system
Enclosed cab	Work clothing and required respiratory protection	PPE required on the pesticide labeling
Enclosed cab acceptable for respiratory protection	Work clothing	PPE required on the pesticide labeling
Any pesticide	Chemical resistant suit	Coveralls and a chemical resistant apron

* For any substitution, all PPE required by the label must be available in case of an emergency

** When using a pressurized system, protective eyewear is required in addition to coveralls, chemical resistant gloves and apron for pesticides with "Danger" or "Warning" or in addition to work clothing for pesticides with "Caution" on the label

*** Using pesticides in water soluble packets is equivalent to mixing with a closed system. However, transfer from mix tank to application tank must be made with closed transfer equipment.